

*SOGOLOVA T.I.*  
KARGIN, V.A.; SOGOLOVA, T.I.; SLONIMSKIY, G.L.; RESTSOVA, Ye.V.

The mechanism of fluidity of polymer formation. Zhur.fiz.khim. 30  
no.8:1903 Ag '56. (MIRA 10:1)

1. Fiziko-khimicheskiy institut imeni L.Ya.Karpova i Institut  
shinnoy promyshlennosti, Moskva.  
(Polymers)

Sogolova, T. I.

✓ Plastic flow of poly(vinyl chloride) under the action of large forces. V. A. Kargin and T. I. Sogolova. *Doklady Akad. Nauk S.S.S.R.* 108, 662-663 (1956). Plastic flow measured at elevated temp. under lab. conditions may be affected by progressive development of structure even during the short test duration; this may account for the apparent absence of true plastic flow in poly(vinyl chloride) plastic. However, when it is used industrially, it can be milled and pressed, and it does show plastic-flow properties. The material is usually pressed by the application of large sudden forces (blows) of up to 800-1000 kg./sq. cm.; this fact shows that the plastic flow unobserved at relatively low stresses does exist at the high temp. and pressure. Polyvinyl solubilities were accordingly compared at 180°, previously milled and unmilled materials being studied. The unmilled material became insol. at 180° in 40-60 min., while the soly. of samples milled at that temp. was found unchanged after several hrs. of milling. The structure-development processes must therefore be compensated by mech. structure-destruction processes, and the observed plastic flow of the polyvinyl samples after milling is presumably a result of combination and destruction processes. The structure growth of polyvinyls is intimately connected with their oxidation, which progresses by chain mechanism, and free radicals must, therefore, be formed under the impacts of large forces. The free radicals will interact with polymer mols. with the production of a branched structure. Materials inhibiting or initiating oxidation should therefore strongly affect equil. between the structure growth and its destruction, and also the chemically produced plastic flow; this has been confirmed.

W. M. Sternberg

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ADAMOVA, T. I. and KASIM, V. A.

"Flow of polyvinylchloride under high pressures," a paper presented at the 9th Congress on the Chemistry and Physics of High Polymers, 28 Jan-2 Feb 57, Moscow, Karyov Inst.

B-3,004,395

AYKHODZHAYEV, B.I.; SOGOLOVA, T.I.; KARGIN, V.A., akademik

Influence of the conditions of structure formation on the mechanical  
properties of gutta-percha. Izv. AN Uz. SSR Ser. khim. nauk no.1:49-  
54 '57. (MIRA 13:10)

(Gutta-Percha)

*SOGOLOVA, T.I.*  
KARYAKINA, M.I.; KARGIN, V.A.; SOGOLOVA, T.I.

Effect of the molecular weight of film-forming substances,  
solvents and plasticizers on stresses in lacquer films. Khim.  
prom. no.5:265-268 J1-Ag '57. (MIRA 10:12)  
(Molecular weights)  
(Strains and stresses)  
(Lacquer and lacquering)

SLONIMSKIY, G. L. and SOGOLOVA, T. I. and KARGIN, V. A.

"The Particularities of Flow in Polymers."

TITLE: General Meeting of the Department for Chemical  
Sciences of the AN USSR Held in May 30-31, and  
June 28, 1957.

PERIODICAL: Izvestiya AN USSR, Otdel. Khim. Nauk, 1957, Nr 11,  
pp. 1416-1419 (USSR)

Sokolov, T. L.

The flow mechanism of poly(vinyl chloride). V. A. Kargin and T. L. Sokolova (L. Ya. Kargin Inst. Phys. Chem., Moscow). *Zhur. Fiz. Khim.* 31, 1824-30 (1957), cf. C.A. 51, 3176c. The polyvinyl structure development is closely connected with an oxidation, developed in a chain reaction (Arlman, C.A. 43, 5548g4), and the destruction processes under high stresses which must result in the free radical formation will affect the oxidation processes. The "chem. flow" process is a term suggested to designate processes which develop from a continuous destruction and recombination of chem. bonds in spatially structured polymers incapable of ordinary flow. The free radicals formed by mech. means will interact with other polymer units, producing branching, which will lower the fluidity of the polymers. Equil. conditions between the mech. destruction and the structurization will become established during milling under certain conditions, caused by an interaction of the free radicals with the mol. chains and by oxidation processes. Poly(vinyl chloride) mixts. are very sensitive to admixts. which can inhibit or initiate chain-oxidation processes. Inhibitors displace the equil. towards the destruction side, and favor the chem. flow, while substances which act as sources of free radicals initiate oxidation processes and lower the chem. flow. Chem. flow processes appear to be common to all systems in which conjugated destruction-recombination processes can develop. The usual flow concept as a prerequisite for milling of polymers must be replaced by a wider concept which will include the chem. flow, produced by a rupture and recombination of chain mols. This process can consist not only in a destruction of branching, or a deterioration of plasticity, but also in a recuperation of plastic properties. A simultaneous addn. of inhibitors and monomers offers possibilities of wide changes in mol. wts., branching, and spatial structurizing of polymers.

W. M. Sternberg

Distr: 4E4j/4E2c(j)

4  
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SOGOLOVA, T. I.

15

. Distr: 4E2c(j)/4E4j/  
4F1/4E4f

Relation between the mechanical properties of gutta-percha, the degree of "structurization," and the temperature. T. I. Sogolova, B. I. Afkhodzhaev, and V. A. Kargin (L. Ya. Karyov Phys. Chem. Inst., Moscow). *Zhur. Fiz. Khim.* 31, 2340-9 (1957).—The variation in the mech. properties of gutta-percha (I) by "structurization" (branching and crosslinking in polymers during manuf., treatment, or use) was investigated over a wide range of temps. The higher the "structurization" of I the lower was its crystallinity. Noncrystg. structurized I had rubberlike properties. Strength, modulus of elasticity, and some other mech. properties of structurized cryst. I were functions of crystallinity and structurization. The mech. properties of amorphous I (at high degrees of structurization at or above its m.p.) were directly detd. by structurization. With cryst. I, vulcanized at 143°, the proportion of combined S detd. characteristic mech. properties and were in agreement with increased deformability. /5

W. M. Sternberg

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SOGOLOVA, T. I.

15  
Relation between the mechanical properties of "structured" gutta-percha and the conditions of cross-linkage formation. R. I. Viskovskiy, T. I. Sogolova, and V. A. Kargin (L. Ya. Karpov Phys. Chem. Inst., Moscow). Zhur. Fiz. Khim. 31, 2881-81 (1957); cf. preceding abstract. Gutta-percha (I) (in the amorphous state) was vulcanized at 143° with finely dispersed S, in S<sub>2</sub>Cl<sub>2</sub> vapors at 70°, and at 20° by adding varying amts. of 5% C<sub>2</sub>S<sub>2</sub> in ether to the 1.25% I soln. in CCl<sub>4</sub>, before forming a film on a cellophane

surface. In the last case the cross linkages were assumed to form before crystn. Cross linkages were produced in already formed cryst. gutta-percha film. The properties of the vulcanized product depended substantially on the phase condition of the films during the development of the structure. The crystn. of I from the amorphous state was reduced by vulcanization by all methods. With about 4% combined S all I was amorphous. During the development of the amorphous structure the no. of cross linkages and the degree of disorder of the chain mols. were both important. The properties of the amorphous polymers of I with varying degrees of disorder were different. The vulcanization of cryst. I did not result in any reduction of crystallinity, which was retained even with 5.6% combined S, but after being heated to above its m.p. and subsequently cooled the vulcanized cryst. I developed a markedly amorphous structure. The properties of I depended on the extent of crystn. and crosslinking and permitted an estn. of structure formation in the cryst. state. W. M. Sternberg.

11  
Distr: 4E20(j)/4E4j

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2

99

SOCOLOVA, T. I., KOTCHESHKOV, K. A., KARGIN, V. A., PALEYEV, O. A., and TALALAYEVA, T. V.,

"High Polymers Obtained Using Organometallic Complexes Containing Lithium and Titanium" paper No. N7, submitted at the International High-Polymer Conference, Nottingham, 21-24 July 1958

Akademiya Nauk SSSR, Leninskiy Prospekt 14, Moscow, USSR

*Translation E-2, 107001*

SOV/58-59-8-17745

Translated from: Referativnyy Zhurnal Fizika, 1959, Nr 8, p 110 (USSR)

AUTHORS: Kargin, V.A., Sogolova, T.I.

TITLE: On the Chemical Flow of Polymers

PERIODICAL: In the symposium: Probl. fiz. khimii. Nr 1, Moscow, Goskhimizdat, 1958, pp 18-21

ABSTRACT: The process of the flow of structured polymers, which is called chemical flow, is explained by breaks in the chemical bonds of the molecular network under the influence of sufficiently great forces. As a result of the fact that the process of flow is in this case accompanied by breaks and recombinations of the molecular chains, the possibility arises of regulating the molecular weight of the polymer in the process of its remaking by means of introducing into the polymer substances which destroy free radicals (in order to reduce the molecular weight) or substances which can be polymerized and which can build up new chains at the broken extremities of the macromolecules. The processes of the

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On the Chemical Flow of Polymers

mechanical breaking and recombination of chemical bonds explain the mechanism of the percussion compression of polymers and lead to the possibility of producing materials which do not flow under ordinary circumstances.

A.N. Genkin

Card 2/2

AUTHORS: Kargin, V. A., Member, Academy of Sciences, SOV/20-120-6-31/59  
USSR, Sogolova, T. I., Aykhodzhaev, B. I.

TITLE: Properties of Guttapercha in Amorphous State (Svoystva gutta-  
perchi v amorfnom sostoyanii)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 120, Nr 6,  
pp 1277 - 1279 (USSR)

ABSTRACT: In the paper under review it is attempted to determine the  
influence of the degree of ordering of chain molecules upon  
the properties of a polymer. Guttapercha, which is a natural  
crystalline polymer, was used in this investigation. Different  
states of ordering could be fixed by a vulcanization at different  
temperatures. The vulcanization was carried out at 143° by  
finely dispersed sulfur, at 70° and 20° in S<sub>2</sub>Cl<sub>2</sub> vapors and at  
20° by mixing a solution of guttapercha in CCl<sub>4</sub> and by mixing  
a solution of S<sub>2</sub>Cl<sub>2</sub> in ether. Data concerning the initial and the  
guttapercha vulcanized under different conditions are presented  
in a table. By means of fixing the different states of gutta-  
percha at different temperatures it was possible to determine

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Properties of Guttapercha in Amorphous State

SOV/20-120-6-31/59

the mechanical properties of guttapercha during the transition from the completely disordered state into the completely ordered state. According to the evidence presented the degree of amorphism of structured crystalline polymers is not only dependent upon the quantity of the formed transverse bindings, but to a high degree also upon the state of the polymer during the structuration process. The smaller the structuration of the polymer, the less thorough will be the subsequent crystallization. At a given content of bound sulfur two completely different types of bound guttapercha with entirely differing mechanical and physical properties can be obtained. At higher vulcanization temperatures a better ordered arrangement of the chain molecules is fixed. This corresponds to an increased deformability, to smaller values of Young's modulus and of the vitrification temperature. There are 1 figure, 1 table, and 11 references, 7 of which are Soviet.

ASSOCIATION: Fiziko-khimicheskii institut im. L. Ya. Karpova (Physicochemical Institute imeni L. Ya. Karpov)

Card 2/3

Properties of Guttapercha in Amorphous State

SOV/20-120-6-31/59

SUBMITTED: March 4, 1958

1. Polymers--Properties    2. Polymers--Molecular structure    3. Polymers:  
--Temperature factors    4. Polymers--Mechanical properties

TITLE: Gutta-percha

Card 3/3

KOCHESHKOV, K.A.; KARGIN, V.A.; TALAIAYEVA, T.V.; SOGOLOVA, T.I.;  
PALEYEV, O.A.

Macromolecular polymers of ethylene obtained from mixtures of  
lithium organic compounds with titanium tetrachloride. Vysokom.  
soed. 1 no.1:152-156 Ja '59. (MIRA 12:9)

1. Fiziko-khimicheskiy institut im. L.Ya.Karpova.  
(Ethylene) (Lithium organic compounds) (Titanium chloride)



KARGIN, V.A.; SOGOLOVA, T.I.; AYKHODZHAYEV, B.I.

Effect of the structure developing process on the crystalline  
state of gutta-percha. Vysokom.sped. 1 no.4:539-541 4p '59.  
(MIRA 12:9)

1. Fiziko-khimicheskii institut im. L.Ya.Karpova.  
(Gutta-percha)

KARGIN, V.A.; SOGOLOVA, T.I.; TALPOV, G.Sh.

Plasticization of crystalline polymers. Part 1: Plasticization  
of isotactic polystyrene and polyethylene terephthalate.  
Vysokom.soad. 1 no.11:1670-1677 N '59. (MIRA 13:5)

1. Fiziko-khimicheskiy institut imeni L.Ya.Karpova.  
(Styrene) (Terephthalic acid)

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15.8500

S/190/60/002/007/013/017  
B020/B052

AUTHORS: Kargin, V. A., Sogolova, T. I.

TITLE: The Effect of Fillers on the Melting Points of Crystalline Polymers

PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 7, pp. 1093-1098

TEXT: High-density polyethylene (with a melting point of 140°C) was investigated. Compounds were chosen as fillers as do not react with polyethylene, and whose melting points are considerably higher than that of polyethylene. These fillers were introduced into the melted polymer by calenders, and remained in the solid state. Hence it could be assumed that they affect the crystalline state of the polymer, without, however, impairing the structure of the chain molecules. Since the change in the crystalline state mainly affects the melting point, the effect of the filler addition on the melting point of polyethylene was investigated first. Therefore, the deformability of the crystalline polymers with different filler amounts in a wide range of temperatures, was investigated by

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The Effect of Fillers on the Melting Points of  
Crystalline Polymers

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dynamometric scales (Ref. 3). On the basis of the thermomechanical curves obtained (Fig. 1), the effect of the filler on the melting point of crystalline polyethylene was investigated. The addition of anthracene, anthraquinone, coke, quartz powder, KCl, aluminum naphthenate, asbestos powder, PbS et al. in different amounts do not affect the melting point of crystalline polyethylene. The mechanical properties of polyethylene (strength, elongation), however, change within a wide range (see Table). The independence of the melting point of crystalline polyethylene from the use of chemically inert, solid fillers, and at the same time the change of a series of mechanical properties prove that solid fillers only decompose the secondary structures in the polymer, the structure of the primary crystalline range remaining unaffected. The decomposition of the crystalline polymer structure by the addition of substances which chemically react with it, was investigated in the crystalline polyamide Γ-548 (G-548) (melting point of 160°) by compounds which are solid at room temperature and have different degrees of dissociation (tungstic, oxalic, and phosphoric acids). For a comparison, the weakly dissociated formic acid was also used. The thermodynamic curves of these mixtures are shown

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The Effect of Fillers on the Melting Points of  
Crystalline Polymers

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in Fig. 2. It was found that the melting point of the crystalline polyamide was reduced. Finally, metal oxides ( $\text{CaO}$ ,  $\text{ZnO}$ ,  $\text{MgO}$ ,  $\text{VO}_3$ ) were used as fillers for the crystalline polyamide. They slightly affect the melting point, but considerably increase the flowing point of the polymer. The addition of larger quantities of metal oxides as fillers causes the formation of materials which are highly elastic or solid above the melting point of the crystalline initial polymer. With very large amounts of metal oxides in crystalline polymers, they lose their fluidity altogether. There are 3 figures, 1 table, and 3 Soviet references.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova  
(Physico-chemical Institute imeni L. Ya. Karpov)

SUBMITTED: March 21, 1960

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S/190/61/003/009/016/016  
B124/B101

AUTHORS: Sogolova, T. I., Metel'skaya, T. K.

TITLE: Effect of anisodiametric-particle fillers on the properties of polymers

PERIODICAL: Vysokomolekulyarnyye soyedineniya, v. 3, no. 9, 1961,  
1428 - 1429

TEXT: The effect of the shape and dimensions of the filler particle on the properties of polymers was studied on a system consisting of polyisobutylene (molecular weight 670,000) and "lavsan" (polyethylene terephthalate) fiber, diameter 20  $\mu$  and 3 - 10 mm long. The dimensional stability of the lavsan fiber remains unchanged even at temperatures above the vitrification point and the flow point of polyisobutylene, and is, therefore, a convenient filler material. It was shown by thermomechanical studies that the flow point of the system, even with a relatively low fiber content of 5 - 10%, is raised by the introduction of the fibers. When the fiber length had been raised from 3 to 10 mm and the fiber concentration to 30 - 40%, the flow point of the system increased. The

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Effect of anisodiametric-particle...

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observed increase of the flow point is due to the rise in viscosity effected by the introduction of anisodiametric particles. This phenomenon is analogous to the increase in viscosity of liquid colloidal systems with an increase in length of the suspended particles, with high-molecular, amorphous polyisobutylene being the dispersion medium and crystalline lavsan fibers the dispersed solid particles in this case. It was established by tensile tests that samples with a high content of long fibers (i. e., with higher viscosity) show strength properties by far superior to the initial polyisobutylene (the strength of polyisobutylene in the systems investigated increases to the 30-fold at most). By an appropriate choice of the particle length of the filler, as well as of its concentration, systems showing high strength and sufficient flow for manufacturing purposes can be obtained. [Abstracter's note: Complete translation.] There are 3 references: 2 Soviet and 1 non-Soviet.

SUBMITTED: July 15, 1961

Card 2/2

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S/063/61/006/004/002/010

A057/A129

AUTHORS: Sogolova, T. I., Candidate of Chemical Sciences, Slonimskiy, G. L.,  
Doctor of Chemical Sciences

TITLE: Thermomechanical method for the study of polymers

PERIODICAL: Zhurnal vsesoyuznogo khimicheskogo obshchestva imeni D. I. Mendele-  
yeva. v. 6, no. 4, 1961, 389-393

TEXT: After discussing characteristics of mechanical properties of poly-  
mers in the present paper the basic principles of the thermomechanical method  
for testing polymers are explained and the application of V. A. Kargin's dyna-  
mometric balance [Ref. 1: ZhFKh, 23, 530 (1949)] is described. Also some  
examples for the use of this method in science and industry are given. The  
method is defined as a determination of the deformability of solid polymers in a  
wide temperature range under a given mechanical stress. Monoaxial compression is  
quoted as the stress most widely used in existing devices. It was first applied  
by Kargin and Sogolov in investigations of three physical states of amorphous  
linear polymers (Ref. 1). The thermomechanical test method is widely used in  
the USSR. Devices with automatic recording and devices in which a continuous

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Thermomechanical method for the study of polymers

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A057/A129

stress is used under a constant rate of temperature increase are also developed (27 Soviet references are cited in this respect). Kargin's decimal analytical balance is shown in Fig. 1. The weight 5 and punch 3 are in balance with the other pan of the balance. The sample with a minimum height of 2 mm and 4 mm in diameter is placed on the lifting plate 1 below the punch. About 0.2 cm<sup>3</sup> of the polymer are sufficient for the investigation. In case of a liquid or loose material the amount was filled into a special beaker 2 which is fixed on the plate 1. The plate is then lifted by means of a screw mechanism until the surface of the sample contacts the bottom of the balanced punch. Plate, sample and punch are covered with a brass jacket 4 and heating or cooling applied. At the present time devices for the range of - 160°C to 400°C and 0°C to 800°C are constructed. The deformation of the sample is measured at the temperature fixed on a thermocouple 7 by removing gradually weights (0.05 g to 100 g), i.e., by increasing the pressure of the punch on the sample and determining the position of the punch. Changes in position of the latter are controlled by measuring the rotation angle of the mirror 6 which is fixed on the balance beam. By measuring deformation at different temperature the temperature function of deformation, i.e. thermomechanical curve, may be obtained (Fig. 2). The curve shows the point of glass-transition temperature  $T_g$  and flow temperature  $T_f$  ✓

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Thermomechanical method ~~the~~ the study of polymers

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for the polymer transition from the glassy to the high-elastic respectively from the latter to the visco-plastic state. Thus by means of thermomechanical curves important characteristics of the polymer are quickly obtained. Also deformation with time can be studied by compressing the sample at constant temperature with the punch. Thermomechanical curves enable the size and flexibility of the macromolecules and the molecular weight and the prospective use of the polymer studied to be determined (Fig. 3). Low-molecular polymer homologues (curves 1-3) can be in the glassy or liquid state. Beginning from a certain molecular weight (typical for each series of homologues) the high-elastic state (curves 4-7) expands to the higher temperature with increasing length of the macromolecule. Thus the minimum size of the latter can be determined with considerable flexibility. Valuable information may also be obtained from the thermomechanical investigations related to the effect of plasticizers, modifiers or fillers [see V. A. Kargin and Yu. M. Malinskiy; Ref. 5: DAN SSSR, 73, 967 (1950); V. A. Kargin, T. I. Sogolova and G. Sh. Talipov; Ref. 19: Vysokomol. soyed., 1, 1670 (1959); Ref. 26: Vysokomol. soyed., 2, 1093 (1960), and physical treatment [see V. A. Kargin and M. N. Shteding, Ref. 6: Khim. prom., no. 2, 10 (74) (1955); V. L. Karpov, Yu. M. Malinskiy, L. V. Mitrofanova, S. T. Sinitsin, E. E. Finkel', A. S. Fridman and S. M. Cherntsov, Ref. 20: Khim. prom.

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Thermomechanical method  the study of polymers

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no. 6, 6/468 (1959); and also Refs. 19 and 26], such as irradiation, or adsorption of vapors of solvents, or aging [see V. A. Kargin and M. N. Shteding, Ref. 7: Khim. prom, no. 3, 9, 137 (1955)], hardening and vulcanization (investigations carried out also by V. A. Kargin and cooperators). Thermostability of polymers can also be evaluated by this method. Changes in chemical composition and structure which might take place on heating are revealed by changes in the shape of the thermomechanical curves (see Fig. 5). The first maximum of curve 2 (in Fig. 5) is effected by structure developments of the polymer resulting in decrease of flexibility and the loss of fluidity. The other extrema are effected by new chemical processes of destruction and structuration with increasing temperature. The last minimum on the curve demonstrates the loss in elasticity of the polymer, i.e., its solid state. Thus an industrial control in thermostability of different charges of technical polymers can be carried out by the thermomechanical method. The latter combined with other mechanical and physico-chemical test methods is the most effective way for the development in the use of polymer materials, according to the opinion of the present authors. There are 5 figures 32 Soviet references.

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NADAREYSHVILI, L.I., SOGOLOVA, T.I.

Study of supermolecular structures of gutta-percha

Report presented at the 13th Conference on High-molecular compounds  
Moscow, 8-11 Oct 62

3630

S/19C/62/004/004/017/019  
B117/B1385.4100  
15.606Y  
AUTHORS:

Kargin, V. A., Sogolova, T. I., Metel'skaya, T. K.

TITLE:

Effect of fillers with anisodiametric particles on the properties of polymers. I

PERIODICAL:

Vysokomolekulyarnyye soyedineniya, v. 4, no. 4, 1962, 601-604

TEXT: The effect of the shape of filler particles on the mechanical properties of polymers was studied with polyisobutylene (molecular weight 670 000 and 1 400 000) filled with "Lavsan" fiber (polyethylene tetraphthalate; fiber diameter 20 $\mu$ , length 25-75 $\mu$  to 10 mm). Tensile tests with films pressed at 80°C showed that strength of the samples and their modulus-50 are already increased at low filler concentration (up to 10%), and that the tensile strength of the samples increases with increasing length of the filler fibers. In compression tests with tablets pressed at 140°C the yield temperature was found to decrease at relatively low filler content (up to 15% by weight) and a fiber length not exceeding 100 $\mu$ . This may be explained by the effect of the filler on the secondary structures existing in amorphous polymers. In the case of longer fibers (3-10 mm), the yield temperature is increased, i. e., the properties of the high-

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B117/B138

Effect of fillers with anisodiametric...

polymer "liquid" of polyisobutylene are affected by size and shape of the particles similar to colloids. When introducing anisodiametric particles, a correlation between the increase of yield temperature and strength was ascertained. During solidification of the polymer its molecular weight is of great importance. Solidification is greater with lower molecular weight of the polymer. The strength of the polyisobutylene samples with different molecular weights and an equal weight of filler is, however, equalized when filler concentration is increased. Materials with properties required for further processing may be produced by altering the length of the filler particles and the filler content. There are 1 figure and 2 tables. The English-language reference is: P. Flory, J. Amer. Chem. Soc., 65, 372, 1943.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physico-chemical Institute imeni L. Ya. Karpov)

SUBMITTED: April 1, 1961

Card 2/2

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S/190/62/004/005/018/026  
B110/B108

15.8001

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AUTHORS: Kargin, V. A., Sogolova, T. I., Pavlichenko, N. P.  
TITLE: Relaxation effects in crystalline polyolefins  
PERIODICAL: Vysokomolekulyarnyye soyedineniya, v. 4, no. 5, 1962,  
738-742

TEXT: The behavior of polyethylene and polypropylene under periodic force action was investigated over a wide range of temperatures. The tests were made in an apparatus devised by Aleksandrov and Gayev (Yu. S. Lazurkin, Zh. tekhn. fiziki, 9, 1261, 1939). A force was applied at frequencies of 1, 10, 100, and 1000 cycles per minute, temperature was varied from -80 to 140°C. Under such conditions, polypropylene was found to possess a broad relaxation spectrum throughout the range from  $T_v$  (vitrification temperature) to  $T_f$  (flow temperature). An attempt was made to ascertain in how far the results obtained depended on the polymer structure. For this purpose, the authors investigated: (1) polypropylene (200°C, 166 kg/cm<sup>2</sup>); (2) hard

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B110/B108

Relaxation effects in crystalline ...

polypropylene ( $200^{\circ}\text{C}$ ,  $166 \text{ kg/cm}^2$ ); (3) amorphous polypropylene; (4) isotactic polypropylene ( $200^{\circ}\text{C}$ ,  $166 \text{ kg/cm}^2$ ); (5) ethylene-propylene copolymer ( $120$  and  $200^{\circ}\text{C}$ ,  $166 \text{ kg/cm}^2$ ); (6) low-density polyethylene ( $170^{\circ}\text{C}$ ,  $166 \text{ kg/cm}^2$ ); and (7) high-density polyethylene ( $140^{\circ}\text{C}$ ,  $166 \text{ kg/cm}^2$ ). The maximum specific pressure of samples 1, 2, 4, 6, and 7 was  $9.6 \text{ kg/cm}^2$ , and that of samples 3, and 5 was  $4.8 \text{ kg/cm}^2$ . Deformation increased substantially from  $0^{\circ}\text{C}$  onward, reached a maximum at  $+30^{\circ}\text{C}$ , and finally decreased again as a result of crystallization. The whole sequence of relaxation processes was found to occur on amorphous polypropylene. Owing to the low molecular weight, the flow temperature  $T_f$  was shifted to lower temperatures. Both high-density and low-density polyethylene possessed a broad relaxation spectrum between  $T_v$  and  $T_f$ . Samples of more irregular shape were obtained by increasing the propylene content in ethylene-propylene copolymers. Crystalline polymers behave like elastic systems capable of withstanding strong deformations. For this reason, it is necessary that relaxation processes be taken into

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Relaxation effects in crystalline ...

S/190/62/004/005/018/026  
B110/B108

account when using articles made of crystalline polymers. There are 2 figures and 1 table.

ASSOCIATION: Institut neftkhimicheskogo sinteza AN SSSR (Institute of Petrochemical Synthesis AS USSR); Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physicochemical Institute imeni. L. Ya. Karpov)

SUBMITTED: April 12, 1961

Card 3/3

TEYTEL'BAUM, B.Ya.; SOGOLOVA, T.I.; SLONIMSKIY, G.L.

Thermomechanical curve method applied in polymer studies.  
Vysokom. soed. 4 no.12:1879-1880 D '62. (MIRA 15:12)

1. Khimicheskiy institut imeni A.Ye. Arbuzova AN SSSR,  
Fiziko-khimicheskiy institut imeni L.Ya. Karpova i Institut  
elementoorganicheskikh soyedineniy AN SSSR.  
(Polymers)

S/020/62/142/003/021/027  
B101/B110

AUTHORS: Kargin, V. A., Academician, Sogolova, T. I., and Talipov, G. Sh.

TITLE: Structure formation in crystalline polystyrene

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 142, no. 3, 1962, 627-628

TEXT: The authors studied the formation of supermolecular structures in crystalline, isotactic polystyrene. The sample was fused onto an object glass, brought to test temperature (120, 145, 175°C) in a thermostat, and the structure formation was investigated and photographed in polarized light with 200 - 600fold magnification by means of an МИМ-8 (MIN-8) microscope. The structure formation was found to be a complicated process, not ceasing with the formation of spherulites. Spherulites both grow and aggregate. At high temperature and prolonged crystallization, the number of growth centers is small, and regular spherulites are formed without disturbances. At low temperature, the growing rate is low but the number of centers is large. In this case, aggregation to bands takes place (length 25 - 500μ, width 1 - 120μ). Spherulites united to bands grow only

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Structure formation in crystalline...

S/020/62/142/003/021/027  
B101/B110

in width (possibly also in thickness) until laminae are formed and the growth ceases. The bands in one lamina are ordered, but their position in superimposed laminae does not coincide. The time of crystallization has the same effect on the formation of supermolecular structure as temperature has. Thus, systems of a desired structure can be produced. No molecules or molecule packages but spherulites of the order of magnitude of colloidal particles act as structural units in polymer systems. A similarity with the formation of gels and jellies is assumed. There are 4 references: 3 Soviet and 1 non-Soviet. The reference to the English-language publication reads as follows: F. Dannusso, G. Moraglio, J. Polymer Sci., 24, 161 (1957). ✓

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physico-chemical Institute imeni L. Ya. Karpov)

SUBMITTED: October 11, 1961

Card 2/2

34:78  
S/020/62/142/004/015/022  
B101/B110

15.8100  
AUTHORS: Kargin, V.A., Academician, Sogolova, T.I., and Talipov, G.Sh.

TITLE: Structure formation in plasticized crystalline polystyrene

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 142, no. 4, 1962. 844 - 846

TEXT: Investigations of the supermolecular structure of nonplasticized polystyrene (DAN, 142, no. 3. (1962)) showed that secondary structures, bands or lamellas, composed of spherulites, developed between 110 and 215°C. The effect of plasticizers on structure formation and mechanical properties of polystyrene (PSt) was now investigated by the same method at 120, 145, and 175°C. The following data were found for the spherulite dimensions (in microns):

Duration of crystallization, min	Initial PSt	Concentration of plasticizer, % by volume						
		A		B		C		
		8	20	15	25	12	18	31
10	4	13	11	10	15	15	-	10
30	8	60	55	35	35	50	50	38
60	17	110	92	70	67	70	-	65
150	40	300	230	260	190	220	-	170

Card 1/2

Structure formation in...

S/020/62/142/004/015/022  
B101/B110

A = cetyl chloride; B = dimethyl phthalate; C = dibutyl sebacate. Thus, an increase in size of the spherulites occurred for all plasticizers, the formation of bands or lamellas, especially above 120°C, being suppressed. The effect of plasticizers was less marked at higher temperatures (175 - 215°C) since under such conditions the spherulites are quickly growing even in nonplasticized PST. The strength of plasticized PST decreased with increasing plasticizer content (Fig. 4). X ray pictures of initial and plasticized PST showed only slight differences. Accordingly, the effect of plasticizer does not consist in a change of the primary crystalline structure (of the spherulite) of the polymer but in a suppression of secondary-structure formation. This also causes a reduction in strength which was investigated at a temperature 25°C higher than the vitrification temperature. There are 4 figures, 1 table, and 2 Soviet references. X

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physico chemical Institute imeni L. Ya. Karpov)

SUBMITTED: October 26, 1961

Card 2/3

S/020/62/147/002/018/021  
B101/B196

AUTHORS: Kargin, V. A., Academician, Sogolova, T. I., Pavlichenko, N.P.

TITLE: Peculiarities of stress relaxation in isotactic crystalline polypropylene

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 147, no. 2, 1962, 407-409

TEXT: Films of crystalline polypropylene were stretched by 8% at 140°C, and the stress-versus-time curve was plotted. Within the first five minutes the stress fell rapidly from  $\sim 120$  to  $\sim 30$  kg/cm<sup>2</sup>, followed by a second drop in stress after 2.5-3.5 hrs. An investigation of the deformed surfaces and cross sections of the samples showed cracking perpendicular to the direction of stress and formation of larger spherulites than in the case of unstretched film. No cracking occurred with amorphous polypropylene. Conclusions: The first drop in stress is due to fast relaxation processes such as generally occur in polymers. Thereupon supermolecular structures and cracks are formed which reduce the actual cross section and cause the second drop in stress. In the formation of irreversible deformations, structural elements

Card 1/2

Peculiarities of stress relaxation...

S/020/62/147/002/018/021  
B101/B186

are displaced under the action of forces exceeding the strength of the material. There are 4 figures.

ASSOCIATION: Institut neftekhimicheskogo sinteza Akademii nauk SSSR  
(Institute of Petrochemical Synthesis of the Academy of  
Sciences USSR); Fiziko-khimicheskii institut im. L. Ya. Karpova  
(Physicochemical Institute imeni L. Ya. Karpov)

SUBMITTED: July 20, 1962

Card 2/2



5  
KOCHESHKOV, K.A., PALEYEV, O.A., SOGOLOVA, T.I., SHEVERDINA, N.I.,  
TALALAYEVA, T.V., RODIONOV, A.N.

Nouveaux composants des catalyseurs de la polymérisation de l'éthylène  
dans des conditions habituelles et inhabituelles.

Report submitted for the International Symposium of Macromolecular Chemistry,  
Paris, 1-6 July 63

ACCESSION NR: AT4020702

S/0000/63/000/000/0107/0113

AUTHOR: Kargin, V. A.; Sogolova, T. I.; Pavlichenko, N. P.

TITLE: Stress relaxation in isotactic polypropylene

SOURCE: Karbotsepnyye vyvokomolekulyarnyye soyedineniya (Carbon-chain macromolecular compounds); sbornik statey. Moscow, Izd-vo AN SSSR, 1963, 107-113

TOPIC TAGS: stress relaxation, polypropylene, isotactic polypropylene, crystalline polypropylene, crystal stress, irreversible deformation, microphotography

ABSTRACT: In order to determine the presence of irreversible deformations in crystalline organic polymers, 0.7 mm films of isotactic crystalline polypropylene, prepared with  $TiCl_3 + Al(C_2H_5)_3$  as a catalyst, were pressed under a load of 70 kg/cm<sup>2</sup> at 200°C and were then tested for stress relaxation at different temperatures and deformations not exceeding 15%. At 120-160°C, polypropylene was found to undergo marked structural changes, as shown by microphotography. The development of an irreversible deformation in polypropylene is due not only to the displacement of the macromolecules or chain bundles, but also to the displacement of larger structural elements. These displacements are accompanied by the appearance of cracks and the failure of the whole sample. Orig. art. has: 6 figures.

Card 1/2

ACCESSION NR: AT4020702

ASSOCIATION: Institut neftekhimicheskogo sinteza AN SSSR (Institute of Petrochemical Synthesis, AN SSSR); Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physico-Chemical Institute)

SUBMITTED: 28Apr62

DATE ACQ: 20Mar64

ENCL: 00

SUB CODE: OC, MT

NO REF SOV: 010

OTHER: 003

Card 2/2

L 12436-63

EWP(j)/EPF(c)/EWT(m)/BDS ASD Pc-4/Pr-4 RM/WW

ACCESSION NR: AP3001156

S/0190/63/005/006/0846/0849

68  
67

AUTHOR: Kocheshkov, K. A.; Kargin, V. A.; Sheverdina, N. I.; Sogolova, T. I.;  
Paleyeva, I. Ye.; Paleyev, O. A.

TITLE: Polymers of ethylene prepared by means of organocadmium-titanium tetra-  
chloride mixtures

SOURCE: Vy\*sokomolekulyarny\*ye soyedineniya, v. 5, no. 6, 1963, 846-849

TOPIC TAGS: polymers, ethylene, organocadmium compounds, titanium tetrachloride,  
polyethylene, dioxanates

ABSTRACT: The polymerization of ethylene was conducted in a reactor filled with ethylene gas to which were added 300 ml of hexane and from 0.025 to 0.007 Mol/liter of an organic cadmium compound, cooled to -30C, and followed by dropwise addition, under constant stirring, of a titanium tetrachloride solution in hexane, in a ratio C-Me/ TiCl<sub>4</sub> = 1/1. The highest yields were obtained with (n-C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>Cd and (p-CH<sub>3</sub>C<sub>6</sub>H<sub>4</sub>)<sub>2</sub>Cd, and it was observed that complexes of the cadmium compounds with dioxane were equally effective. In comparing the polymerization processes conducted with diphenylcadmium and phenylcadmiumiodide it was found that the yield of an essentially similar polyethylene amounted in the

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L 12436-63

ACCESSION NR: AP3001156

latter case to only one-half of the one obtained with diphenylcadmium, thus revealing the equivalency of the same radicals in the organometallic component in the catalyst and the essential role played by their number. The obtained polyethylenes were essentially white powders. Thermomechanical studies were conducted on films obtained at 180-185C and 90-100 atm, which were stretched in one direction. It was found that the polymers possessed sufficiently high values of recrystallization stress and tensile strength and high stretch and softening point values, the latter in the 130-135C range. Orig. art. has: 2 tables.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physico-Chemical Institute)

SUBMITTED: 25Nov61

DATE ACQ.: 01Jul63

ENCL: 00

SUB CODE: 00

NO REF SOV: 006

OTHER: 005

Card 2/2

L 11286-63

EWP(j)/EWT(m)/BDS--AFFTC/ASD--Pc-4--RM/MAY

ACCESSION NR: AP3001167

S/0190/63/005/006/0921/0924

AUTHOR: Kargin, V. A.; Sogolova, T. I.; Shaposhnikova, T. K.

62  
61

TITLE: Effect of fillers with particles of irregular shape on the properties of polymers. II.

SOURCE: Vysokomolekulyarnyye soyedineniya, v. 5, no. 6, 1963, 921-924

TOPIC TAGS: reinforcement, filler, polyvinyl alcohol, glycerin,  $V_2O_5$  sol, sol lifetime, filler particle shape, asymmetrical secondary structure

ABSTRACT: The reinforcement of polymers with fillers composed of particles of irregular shape and a thickness commensurate with bundles of the polymer molecules has been studied. Experiments were conducted with films prepared from polyvinyl alcohol (PVA), plasticized with glycerin, and an aqueous dispersion of  $V_2O_5$ . Freshly prepared  $V_2O_5$  sols are amorphous, with particles of irregular shape. The sols become crystalline after a time, and needlelike particles 10 to 20 Å thick, with length increasing with time, are formed. Their length can be controlled by changing the lifetime of the sol. The growth of the particles practically ceases in the viscous polymer medium. Experiments conducted with PVA plasticized with 28% glycerin (tensile strength, 200 kg/cm<sup>2</sup>) showed that the strength of the

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L 11286-63

ACCESSION NR: AP3001167

specimens increases by about 50 to 100% with an increase in sol concentration of up to 10% and, to a certain extent, with an increase in the particle length. A highly reinforcing effect is produced only by particles of irregular shape; the effect of crystalline  $V_2O_5$  is very slight. It was shown by analysis of PVA plasticized with 45 to 50% glycerin (tensile strength, 90 kg/cm<sup>2</sup>) that the reinforcing effect of the filler is higher in polymers with a lower strength. Microscopic studies revealed that after 72 hr pure  $V_2O_5$  sols develop asymmetrical secondary structures similar to those of polymers and that these structures remain in the presence of PVA. The increase in the reinforcing effect of  $V_2O_5$  sols with an increase in sol lifetime can be ascribed not only to the presence of irregular particles, but also, to a certain extent, to their aggregation into asymmetrical secondary formations. Orig. art. has: 2 figures.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physicochemical Institute)

SUBMITTED: 26Dec61

DATE ACQ: 01Jul63

ENCL: 00

SUB CODE: CH

NO. OF SOV: 005

OTHER: 000

1s/10  
Card 2/2

ACCESSION NR: AP4007979

S/0190/63/005/012/1809/1816

AUTHORS: Kargin, V. A.; Sogolova, T. I.; Talipov, G. Sh.

TITLE: Supermolecular structure of plasticized and nonplasticized crystalline polystyrene

SOURCE: Vy\*sokomolekulyarny\*ye soyedineniya, v. 5, no. 12, 1963, 1809-1816

TOPIC TAGS: polymer, polystyrene crystalline, polystyrene, plasticized crystalline polystyrene, plasticization, plasticizer, secondary structure, globule, spherulite, bundle, rod, supermolecule structure formation, plasticized polystyrene mechanical property, polymer mechanical property, phthalic acid dimethyl ester, cetyl chloride, supermolecular structure

ABSTRACT: The supermolecular structure of plasticized (dimethyl-phthalate and cetyl chloride plasticizer) and nonplasticized crystalline polystyrene has been studied in temperature intervals from 110-215°C and at crystallization durations of 10 to 150 minutes. The structure-forming process was observed under a polarizing microscope MIN-8 with a 200-600 magnification. A new type of structuralization was discovered, in which spherulites serve as initial structure units, commensurable

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ACCESSION NR: AP4007979

in dimension with the colloidal particle size. It was found that the plasticizer has a substantial effect on the nature and dimensions of crystalline polymer secondary structure, and a definite correlation was established between plasticized polymer macrostructure and its mechanical properties. Orig. art. has: 16 micro-photographs and 1 chart.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physicochemical Institute)

SUBMITTED: 24Apr62

DATE ACQ: 20Jan64

ENCL: 00

SUB CODE: MA

NO REF SOV: 004

OTHER: 001

Card 2/2

SOGOLOVA, T.I.; SLONIMSKIY, G.L.; KARGIN, V.A.

Viscoplastic flow and flow temperature of polymers. Vysokom.  
soed. 5 no.12:1875-1878 D '63. (MIRA 17:1)

1. Fiziko-khimicheskiy institut im. Karpova i Institut  
elementoorganicheskikh soyedineniy AN SSSR.

ACCESSION NR: AM4009161

8/0190/64/006/001/0165/0168

AUTHORS: Kargin, V. A.; Sogolova, T. I.; Nadareyshvili, L. I.

TITLE: Investigation of supermolecular structure effect on mechanical properties of crystalline polymers 1. Production of various supermolecular structures during formation of gutta-percha films and study of their mechanical properties

SOURCE: Vy\*sokomolekulyarny\*ye soyedineniya, v. 6, no. 1, 1964, 165-168

TOPIC TAGS: supermolecular structure, gutta percha film, crystalline polymer, melt, optical microscope, mechanical property

ABSTRACT: Conditions for production of films with various supermolecular structures have been studied. Films with varying mechanical properties can be produced from the same crystalline polymer. The gutta-percha test films were produced both from melts and solutions, using as solvents: benzol,  $\text{CCl}_4$ , and tetrachloroethane. The structure of the films was investigated under the optical microscope MIM-8M and MIN-8. The mechanical properties of these films have been shown to depend upon their supermolecular structure. It is stressed that relations between mechanical properties and the nature of the supermolecular structure can be established most effectively by varying only one of the factors determining the

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ACCESSION NR: AP4009161

structuration process (temperature, solvent species, time of evaporation of the solvent, or cooling of the melt, etc.), all other parameters being kept strictly constant. Orig. art. has: 7 figures and 2 tables.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physicochemical Institute)

SUBMITTED: 14Nov62

DATE ACQ: 10Feb64

ENCL: 00

SUB CODE: PH

NO REF SOV: 007

OTHER: 004

Card 2/2

ACCESSION NR: AP4009162

S/0190/64/006/001/0169/0173

AUTHOR: Kargin, V. A.; Sogolova, T. I.; Nadareyshvili, L. I.

TITLE: Investigation of the effect of supermolecular structure on the mechanical properties of crystalline polymers. 2. Nature of spherulite structure breakdown and mechanical properties on repeated gutta-percha film deformation

SOURCE: Vy\*sokomolekulyarny\*ye soyedineniya, v. 6, no. 1, 1964, 169-173

TOPIC TAGS: spherulite structure, repeated deformation, gutta percha film, supermolecular structure, supermolecular stress, supermolecular strain, film deformation

ABSTRACT: The character of the spherulite-like structure breakdown of gutta-percha films by repeated deformation has been investigated under microscope MIM-8. It is shown that mechanical properties of gutta-percha films may be changed over wide ranges by repeated deformation in mutually perpendicular directions. The supermolecular

Card 1/2

ACCESSION NR: AP4009162

structure of gutta-percha films changes after the first stretching, as seen from corresponding experimental stress-strain curves. It is shown that recovery of the initial supermolecular structures by heating the deformed films in nitrogen at 60C for 1 hr makes it possible to obtain gutta-percha with practically identical mechanical properties as those of the initial films. Orig. art. has: 5 figures and 2 tables.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova  
(Physicochemical Institute);

SUBMITTED: 14Nov62

DATE ACQ: 10Feb64

ENCL: 00

SUB CODE: MT,SS

NO REF SOV: 002

OTHER: 000

Card 2/2

ACCESSION NR: AP4040481

S/0190/64/006/006/1022/1027

AUTHOR: Kargin, V. A.; Sogolova, T. I.; Shaposhnikova, T. K.

TITLE: Structure formation in and mechanical properties of chloroprene rubber

SOURCE: Vy\*sokomolekulyarny\*ye soyedineniya, v. 6, no. 6, 1964, 1022-1027

TOPIC TAGS: crystallizing polymer, polychloroprene rubber, Nairit A, polychloroprene film, structure formation

ABSTRACT: Structure formation in crystallizing elastomers as exemplified by Nairit-A (polychloroprene rubber) films about 200  $\mu$  thick has been studied to establish the relationship between mechanical properties and the supramolecular structure of the elastomers. The films were prepared by evaporation from various solvents and the process of structure formation in individual specimens under various conditions was observed with the MIM-8 microscope. It was shown that dendrite structures, cruciform crystals, and crystals with

Card 1/3

ACCESSION NR: AP4040481

regular faces are formed at the film surfaces. The growth of these supramolecular formations ceases after about 150 hr of crystallization. Simultaneously, a fine spherulite structure is formed in much of the body of the film; this process stops after approximately 220 hr. A considerable strengthening of films observed after termination of the growth of the larger supermolecular structures was ascribed to spherulitization of the films. It was also shown that in the case of Nairit-A spherulitization of a crystallizing rubber and the presence of larger supramolecular structures does not cause a loss of the elastic properties and does not hinder development of significant reversible deformations in these elastomers. It is concluded that the elasticity of crystallizing elastomers is due not only to the elasticity of individual macromolecules, chain bundles, ribbons, and fibrils but also to the elasticity of more complex supramolecular formations — spherulites, dendrites, and even crystals with regular faces. Orig. art. has: 2 figures and 1 table.

ASSOCIATION: Fiziko-khimicheskiy institut imeni L. Ya. Karpov  
(Physicochemical Institute)

Cord 2/3



KARGIN, V.A.; SOGOLOVA, T.I.; NADAREYSHVILI, L.I.

Supermolecular structures in films of isotactic polypropylene  
and their mechanical properties. Vysokom. soed. 6 no.7:1272-  
1274 J1 '64 (MIRA 18:2)

1. Fiziko-khimicheskiy institut imeni Karpova.

ACCESSION NR: AP4043778

S/0190/64/006/008/1407/1410

AUTHOR: Kargin, V. A., Sogolova, T. I., Nadareyshvili, L. I.

TITLE: Effects of the spherulite structure breakdown pattern on the mechanical properties of isotactic polypropylene in a broad temperature range

SOURCE: Vy\*sokomolekulyarny\*ye soyedineniya, v. 6, no. 8, 1964, 1407-1410

TOPIC TAGS: polypropylene, isotactic polypropylene, polypropylene film, spherulite, spherulite breakdown, polymer mechanical property, polymer structure

ABSTRACT: A powdered isotactic polypropylene containing 88% of the isotactic fraction, 5% of a low-molecular fraction and 7% of the atactic fraction, molten at 180C, was gradually cooled to 80C in the course of 1 hr. during which films, 40-100  $\mu$  thick, with a spherulite structure composed of  $\sim 100 \mu$  grains were prepared to investigate the relationship between the mechanical properties of the material and the condition of the spherulite structure. Changes in the spherulite structure were examined with a MIN-8 optical microscope in a series of tests, conducted at 20, 50, 70 120 and 140C, in which film samples were stretched, using a pendulum dynamometer, at a rate of 3 cm/min. Depending on the temperature, uniaxial film stretching caused various changes in the film structure and mechanical properties. The changes, which have a rather complex pattern, are discussed

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ACCESSION NR: AP4043778

in detail and shown in photographs. At 20C brittle breakdown takes place with the spherulites remaining practically intact. At 50-70C considerable deformation with necking occurs, but with retention of the central parts of the spherulites and their interfacial boundaries. At 120C there is very large deformation, accompanied by breakdown of the spherulites into separate fibrils. At 140C the films breakdown at comparatively low deformation (breakdown of the specimen may be accompanied by fusing down of the rupture faces). The non-simultaneous appearance of various spherulites and supra-spherulite formations lead to differences in packing density, structure, size and mechanical properties of these elements, a consequence of which is their nonsimultaneous breakdown on stretching of the films. The decrease in sharpness of the neck boundary as the thickness of the specimens increases (other conditions being equal) is associated with the superposition of numerous micronecks formed in the separate structural elements of the film. Orig. art. has: 8 figures.

ASSOCIATION: Fiziko-khimicheskiy institut im L. Ya Karpova (Physical-Chemical Institute)

SUBMITTED: 13Aug63

SUB CODE: MT

NO REF SOV: 003

OTHER: 000

Card 2/2

RAPOPORT-MOILODTSOVA, N.Ya.; BOGAYEVSKAYA, T.A.; KORETSKAYA, T.A.;  
SOGOLOVA, T.I.; KARGIN, V.A., akademik

Fibrous structures and the formation of an isotactic polystyrene  
jelly. Dokl. AN SSSR 155 no. 5:1171-1173 Ap '64. (MIRA 17:5)

1. Fiziko-khimicheskiy institut im. L.Ya.Karpova.

ACCESSION NR: AP4040957

S/0020/64/156/005/1156/1158

AUTHOR: Kargin, V. A. (Academician); Sogolova, T. I.; Shaposhnikova, T. K.

TITLE: Control of the supramolecular structure of polymers by artificial seeding

SOURCE: AN SSSR. Doklady\*, v. 156, no. 5, 1156-1158

TOPIC TAGS: polymer, crystallizing polymer, polymer supramolecular structure, polypropylene, artificial seeding, isotactic polystyrene, indigo, polymer supramolecular structure control, polymer mechanical property control

ABSTRACT: The possibility of controlling the supramolecular structure of polymers by artificial seeding has been studied for a number of crystallizing polymers. Experiments conducted with polypropylene containing 1% finely divided isotactic polystyrene or indigo as seed showed that the desired supramolecular structures can be obtained by seeding polymer melts. The melting point of the seeds must be lower

Card 1/2

ACCESSION NR: AP4040957

than that of the polymer, they must not react with or dissolve in the polymer, and they must have the desired supramolecular structure. Thus, the supramolecular structure of polymers can be controlled by artificial seeding. In turn, the mechanical properties of polymers depend on their supramolecular structure so that control of this structure makes it possible to produce materials with different mechanical properties from a given polymer. Orig. art. has: 1 figure.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physico-chemical Institute)

SUBMITTED: 22Feb64

ATD PRESS: 3050

ENCL: 00

SUB CODE: OC

NO REF SOV: 008

OTHER: 002

Card 2/2

KARGIN, V.A.; SOGOLQVA, T.I.; NADAREYSHVILI, L.I.

Character of spherulite structure breakdown as affecting the mechanical properties of isotactic polypropylene in a wide range of temperatures.  
Vysokom.soed. 6 no.8:1407-1410 Ag '64. (MIRA 17:10)

1. Fiziko-khimicheskiy institut imeni L.Ya. Karpova.

L 11381-65 EWI(m)/EPF(c)/EPR/EWP(j)/T PC-4/Pr-4/Ps-4 WW/RM  
ACCESSION NR: AP4045420 S/0190/64/006/009/1559/1561

AUTHOR: Kargin, V. A.; Sogolova, T. I.; Rapoport-Molodtsova, N. Ya.

TITLE: Deformation of supraspherulite formations in plasticized isotactic polystyrene

SOURCE: Vyssokomolekulyarnyye soyedineniya, v. 6, no. 9, 1964, 1559-1561

TOPIC TAGS: supramolecular structure, spherulite, ribbon, ribbon lamina, uniaxial deformation, isotactic polystyrene, plasticized isotactic polystyrene, supramolecular structure deformation

ABSTRACT: The role of individual supramolecular structures in the deformation of polymers has been studied for plasticized isotactic polystyrene. The study was undertaken to determine the effect of supramolecular structures on the mechanical properties of polymers in order to make it possible to establish which structures best withstand different types of mechanical action. The experiments were conducted with films of slowly crystallized isotactic polystyrene plasticized with 18% cetyl chloride. The films contained various supramolecular

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L 11381-65

ACCESSION NR: AP4045420

formations — spherulites, ribbons of spherulites, or laminas of ribbons — separated by amorphous regions. Deformation and failure of these structures during uniaxial stretching were observed with the MIN-8 polarizing microscope. Study of micrographs disclosed the nature of the deformation and failure of individual supramolecular formations. It showed that the deformation and failure are highly dependent on the arrangement of the formations in respect to the force field. Thus, the dependence of the mechanical properties of anisotropic supramolecular structures on the direction of the applied force field has been shown for the first time by direct experiments. Orig. art. has: 6 figures.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physicochemical Institute)

SUBMITTED: 14Aug63

ATD PRESS: 3114

ENCL: 00

SUB CODE: OC, MT

NO REF SOV: 006

OTHER: 000

Card 2/2

L 6008-65

EW(m)/EPF(c)/EWP(j)/T Pc-4/Pr-4 RM

5/0190/64/006/009/1562/564

ACCESSION NR: AP4045421

AUTHOR: Kargin, V. A.; Sogolova, T. I.; Rapoport-Molodtsova, N. Ya.

TITLE: Morphology of the process of neck formation during uniaxial stretching of crystalline polystyrene films

SOURCE: Vyssokomolekulyarnyye soyedineniya, v. 6, no. 9, 1964, 1562-1564

TOPIC TAGS: polystyrene, crystalline polystyrene, polystyrene film, polymer film stretching, uniaxial stretching, neck formation, film necking, polymer film structure

ABSTRACT: Films for optical and mechanical studies of neck formation (in crystalline polymers) were prepared by melting purified isotactic polystyrene at 275C for 2 min between two microscope slides and crystallizing the melt at 160C. The number and pattern of crystallization centers were controlled by varying the duration of cooling from 1 to 2-1/2 hrs. The films were stretched at 160C, and their structure was examined with a MIN-8 polarization microscope. The results show that in completely spherulized films there is a discontinuous formation of structurally nonhomogeneous necks with alternating regions of oriented and nonoriented crystallization; the elongation of an individual spherulite usually has a discontinuous pattern with a distinct boundary line between the deformed and nondeformed

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L 6608-65

ACCESSION NR: AP4045421

region; the pattern of deformation of spherulite "strings" markedly changes with crystallization rate; in a 1-hr. process the continuity of a string is disrupted between individual spherulite members, while in a 2.5-hr. process contacts between spherulites remain unaffected, and the deformation results in a single integral string of elongated individual spherulites; in a power field the deformation of spherulites has a stepwise character. The authors conclude that the structural pattern of necks arising during the elongation of crystalline films is determined by the supermolecular structure of the original film prior to the orientation process. Orig. art. has: 7 figures.

ASSOCIATION: Fiziko-khimicheskiy Institut im. L. Ya. Karpova (Physical-Chemical Institute)

SUBMITTED: 24Aug63

ENCL: 00

SUB CODE: MT

NO REF SOV: 004

OTHER: 002

Card 2/2

L 16374-65 EWT(m)/EPF(c)/EWP(j)/T Pc-4/Pr-4 ASD(m)-3 RM

ACCESSION NR: AP4049149

S/0190/64/006/011/1955/1958

AUTHOR: Paleyev, O. A.; Kocheshkov, K. A.; Kargin, V. A.; Sogolova, T. I.;  
Ly\*chkova, V. F.

TITLE: Effect of the degree of dispersion of the organometallic component of a mixed catalyst on the polymerization of ethylene

SOURCE: Vy\*sokomolekulyarny\*ye soyedineniya, v. 6, no. 11, 1964, 1955-1958

TOPIC TAGS: polyethylene, polymerization catalyst, organometallic catalyst, hexane, phenyl lithium, butyl lithium, ethyl lithium, mixed catalyst, catalyst particle size, ethylene polymerization

ABSTRACT: The dependence of the polymerization and properties of polyethylene on the chemical composition and degree of dispersion of the organometallic component of the mixed catalyst was investigated. The mixed catalyst was prepared in the same manner in all cases: ethylene-saturated n-hexane; ratio of RLi:TiCl<sub>4</sub>=1:1, careful stirring, temperature of -60 to -70C. The solid organometallic component C<sub>6</sub>H<sub>5</sub>Li of varying particle size was prepared by the double decomposition of C<sub>6</sub>H<sub>5</sub>Br and alkyl-Li in various media. The degree of dispersion was estimated by visual observation under the microscope and also

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L 16374-65

ACCESSION NR: AP4049149

by comparing the infrared spectra of pure crystalline compounds. The micrographs showing the spherulitic structure of polyethylene indicate that the polymer reflects, to a certain extent, the form of the undissolved crystallites of the organometallic component. The difference in the size of the polyethylene spherulites is not greater than 1.6:1 according to the type of phenyl-Li used, and this does not affect the mechanical properties. The rate of ethylene absorption (maximum at 0-30°C) and the yield of polymer (maximum = 2500 g/g equiv. with phenyl-Li made from bromobenzene and n-butyl lithium in hexane) were found to be directly related to the dispersion of the organometallic compound in the medium. The infrared spectra of phenyl-lithium samples (four types) showed almost complete identity. The intensity of the band varied slightly only over the range 900-1100  $\text{cm}^{-1}$ , due usually to the deformation oscillation of the C-H bonds in the monosubstituted benzene depending on the method of preparation. Although this variation in intensity is not great, on the basis of it a difference in the packing and structure of the crystals can be assumed, which limits the movement of the C-H group in the molecule. The mechanical properties of polyethylene do not depend on the dispersion of the catalyst component, but do depend on the chemical composition of the catalyst. "The authors express their gratitude to T. V. Talalayeva and A. N. Rodinov for their valuable suggestions and assistance in this work." Orig. art. has: 4 figures and 1 table.

Card

2/3

L 16374-65

ACCESSION NR: AP4049149

ASSOCIATION: Fiziko-khimicheskiy Institut im. L. Ya. Karpova (Physicochemical  
institute)

SUBMITTED: 28Dec63

ENCL: 00

SUB CODE: OC, LC

NO REF SOV: 008

OTHER: 000

Card 3/3

L 15997-65 ENT(m)/EPF(c)/ENP(j)/T Pc-4/Pr-4 AFWL/ASD(a)-5/ASD(m)-3  
ACCESSION NR: AP4049160 RM S/0190/64/006/011/2090/2092

AUTHOR: Kargin, V. A.; Sogolova, T. I.; Rapoport-Molodtsova, N. Ya.

TITLE: Effect of the size and geometric form of heterogeneous crystallization nuclei on the supramolecular structure of crystalline polymers

SOURCE: Vy\*sokomolekulyarny\*ye soyedineniya, v. 6, no. 11, 1964, 2090-2092

TOPIC TAGS: polymer, gutta-percha, isotactic polystyrene, crystallization, heterogeneous nucleation nucleus

ABSTRACT: In earlier studies the authors have shown that the artificial introduction of heterogeneous crystallization nuclei into crystallizing polymers is an effective method for controlling their supramolecular structures and, thereby, their mechanical properties (Dokl. AN SSSR, 156, 1156, 1964; Dokl. AN SSSR, 156, 1406, 1964). This study deals with the effect of the form, size, and number of these nuclei on the structure of gutta-percha and isotactic polystyrene films. Organic substances which do not react with the polymer and

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L 15997-65  
ACCESSION NR: AP4049160

2  
whose melting point is higher than that of the polymer (such as indigo, salicylic acid, hexachlorobenzene, or anthracene in the case of gutta-percha, and indigo or alizarin in the case of isotactic polystyrene) were used as heterogeneous crystallization nuclei. The polymers were mixed with the nuclei in a common solvent and crystallized from melts or solutions. Study of the polymer structures by optical microscopy showed that the size of supramolecular structures in the polymers is determined by the size and number of nuclei, but the nature of supramolecular structures is determined by the geometric form of the nuclei. Orig. art. has: 6 figures.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova  
(Physicochemical Institute)

SUBMITTED: 25Feb64

ENCL: 00

SUB CODE: GC, OC

NO REF SOV: 008

OTHER: 004

ATD PRESS: 3146

Card 2/2



KARGIN, V.A., akademik; SOGOLOVA, T.I.; RAPOPORT-MOLODTSOVA, N.Ya.

Effect of artificial crystallization nuclei on the kinetics of crystallization and the mechanical properties of isotactic polystyrene. Dokl. AN SSSR 156 no.6:1406-1408 Je 64. (MIRA 17:8)

1. Fiziko-khimicheskiy institut imeni L.Ya. Karpova.

L 40710-65 EPF(c)/EWP(j)/EWT(m)/T Pc-4/Pr-4 RM

ACCESSION NR: AP5011985

UR/0374/65/000/001/0005/0016

AUTHOR: Sogolova, T. I. (Moscow)

TITLE: Morphological forms in polymers and their effects on the mechanical properties of polymers

SOURCE: Mekhanika polimerov, no. 1, 1965, 5-16, and inserts following p. 16

TOPIC TAGS: polymer, polymer structure, polymer physical chemistry

ABSTRACT: A review of studies, most of which were made by Academician V. A. Kargin, on the formation of morphological forms (supramolecular structures) in high polymers and on their effect on the mechanical properties of high polymers is presented under the headings: Variety of supramolecular structures in polymers; influence of external effects on supramolecular structures; control of supramolecular structures in polymers.

Card 1/2

I. 40710-65

ACCESSION NR: AP5011985

0

It is concluded that polymers exhibit a great variety of supramolecular structures which considerably affect their mechanical properties. Owing to the coexistence of various morphological forms, the crystallization, melting, and mechanically induced structural transformations proceed stepwise in polymers and result in a heterogeneous and unstable structure of polymeric materials. The main goal of "structural mechanics" of polymers is the establishment of relationships between individual supramolecular structures and mechanical properties of polymeric materials for the purpose of controlling and stabilizing these structures. This can be accomplished most efficiently by artificial seeding. The main trend which can be traced in the studies reviewed is the development of new polymeric materials with improved mechanical properties. Orig. art. has: 31 figures and 5 graphs.

ASSOCIATION: none

SUBMITTED: 60

ENCL: 00

SUB CODE: MT, GG

NO REF SOV: 061

OTHER: 14

ATD PRESS: 3202-F

Card 2/2 mb

L 27626-65 EWT(m)/EPA(s)-2/EPF(c)/T/EWP(j)/EPR/EWA(c) Pc-4/Pr-4/Ps-4/Pt-10  
ACCESSION NR: AP5005590 WW/RM 6/0190/65/007/002/0229/0231

RPL

AUTHOR: Kargin, V. A.; Sogolova, T. I.; Shaposhnikova, T. K.

TITLE: Use of artificial crystallization nuclei for producing anisodiametric morphological forms in crystallizing polymers

SOURCE: Vysokomolekulyarnyye soyedineniya, v. 7, no. 2, 1965, 229-231

TOPIC TAGS: crystallizing polymer, polyurethan, artificial seeding, anisodiametric particle, morphological form, polymer strength

ABSTRACT: It has been shown that artificial seeding of crystallizing polymers with acicular particles of high-melting organic compounds makes it possible to produce anisodiametric morphological forms and increase the strength of polymers. The experiments were conducted with polypropylene (PP) solutions and melts. Introduction of hexachlorobenzene (HCB) into xylene solutions of PP followed by evaporation of the solvent and sublimation of HCB at 140C yielded PP films which contained anisodiametric structures (bands of spherulites). However, sublimation of the seeds loosened the structure of PP and adversely affected the strength of the films. Incorporation of 0.5—3.0% alizarin into xylene solutions of PP followed by evapora-

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L 27626-65

ACCESSION NR: AP5005590

tion of the solvent at 140C and melting of the deposited films at 210C, or direct incorporation of alizarin into PP melts at 210C followed by a slow cooling of the melt to 20C, also yielded PP films which contained bands of spherulites. Study of the stress-strain curves of films prepared from melts showed that alizarin increases PP strength by about 50%. Orig. art. has: 5 figures. [B0]

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physicochemical Institute)

SUBMITTED: 01Apr64

ENCL: 00

SUB CODE: 0C, 0G

NO REF SOV: 006

OTHER: 000

ATD PRESS: 3190

Card 2/2

L 36229-65 - EWT(m)/EPF(c)/EWP(j)/T Pc-4/Pr-4 RM S/0190/65/007/003/0385/0388 26  
 ACCESSION NR: AP5008360 24  
 15B

AUTHOR: Kargin, V. A.; Sogolova, T. I.; Shaposhnikova, T. K.

TITLE: Nucleation mechanism of the action of solid particles in crystallizing polymers 1

SOURCE: Vysokomolekulyarnyye soyedineniya, v. 7, no. 3, 1965, 385-388

TOPIC TAGS: seeding, morphological form, supramolecular structure, heterogeneous nucleus, polymer

ABSTRACT: Seeding polymers with heterogeneous crystallization nuclei (inert solid compounds whose melting point is above that of the polymer) is an effective method of controlling the morphological forms (supramolecular structures) of polymers. Study of the nucleation mechanism showed that seeding causes stresses in the polymer-nucleus boundary layer. These stresses can be observed in a polariscope as a luminous contour. Stresses result in the formation of microscopic oriented polymer sections at the polymer-nucleus boundary. These sections favor crystallization and formation of supramolecular structures as the melt cools. The results of an investigation of the nucleation mechanism with a number of polymers and different seeds are described in this paper. It was shown that the magnitude of

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L 30800-65

ACCESSION NR: AP5008360

stresses caused by artificial crystallization of nuclei depends on their size, on the nature of the polymer and nucleus, and on the nature of their interaction. The authors think that it is possible to seed with nuclei which react chemically with the polymer. The microscopic ordering of polymer sections caused by stresses is unstable; supramolecular structures formed on the nuclei were shown to break down irreversibly at temperatures above the melting point of the polymer when the nuclei were removed (e.g., by sublimation for the case of polypropylene seeded with hexachlorobenzene). Orig. art. has: 4 figures. [B0]

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpov (Physicochemical Institute)

SUBMITTED: 01Apr64

ENCL: 00

SUB CODE: OC, ss

NO REF SOV: 002

OTHER: 000

ATD PRESS: 3220

Card 2/2 30

L 35435-65 EPF(c)/EPR/EWT(d)/EWT(m)/T/EWP(w) Pc-l/Pr-l/Ps-l EM/RM/VW

ACCESSION NR: AP5008362

S/0190/65/007/003/0394/0396

AUTHORS: Kargin, V. A.; Sogolova, T. I.; Pavlichenko-Krasnikova, N. P.

TITLE: On the characteristics of irreversible deformations in crystalline polyolefins

SOURCE: Vysokomolekulyarnyye soyedineniya, v. 7, no. 3, 1965, 394-396

TOPIC TAGS: polyolefin, deformation mechanism, stress relaxation, polypropylene, polymer, polyisobutylene, defect formation, material failure / MIN 8 microscope, MIN 8M microscope

ABSTRACT: An experimental study of the relaxation phenomena in crystalline polyolefins under stress and at high temperatures was conducted. Specimens of polypropylene were melted at 180C, and films  $\approx 20\mu$  thick were held for various periods at 140C. They were then studied under polarized light with an MIN-8 microscope. The spherulites were found to increase in size (reaching 700-800 $\mu$  in 4 hours) and to acquire numerous defects. Films 700 $\mu$  thick studied under a metallographic microscope MIN-8M showed surface spherulites with radial cracks upon being heated at 140-160C. No surface spherulites were found in specimens heated at lower temperatures, but all the specimens held at 60-160C acquired

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L 35435-65

3

ACCESSION NR: AP5008362

crystal-like formations. The study showed that the irreversible deformation is brought about by the translocation of large structural elements and that tension cracks lead to the failure of crystalline polypropylene. Stress relaxation was found to be complicated by structural changes leading to the formation of defects. Introducing polyisobutylene into polypropylene diminished the number of cracks. (Abstracter's note: original article includes references to 5 figures, none of which are shown).

ASSOCIATION: Institut neftekhimicheskogo sinteza AN SSSR im. A. V. Topchiyeva (Institute of Petrochemical Synthesis, AN SSSR); Fiziko khimicheskii institut im. L. Ya. Karpova (Physico-chemical Institute)

SUBMITTED: 04Apr64

ENCL: 00

SUB CODE: 00

NO REF SOV: 005

OTHER: 000

Card 2/2

KARGIN, V.A.; SUGOLOVA, T.I.; KARPOM-MOLODTSOVA, N.Ya.

Structure and mechanical properties of plasticized isotactic polystyrene in the presence of artificial crystallization nuclei. (MIRA 18:6)  
Vysokom. soed. " no.4:576-579 Ap '65.

1. Fiziko-khimicheskiy institut imeni Karpova, Moskva.

L 9492-66 EWT(m)/EWP(j)/T WW/RM  
ACC NR: AP6001865

SOURCE CODE: UR/0190/65/007/012/2108/2111

AUTHOR: Kargin, V. A.; Sogolova, T. I.; Kurbanova, I. I.

ORG: Physicochemical Institute im. L. Ya. Karpov (Fiziko-khimicheskiy institut)

TITLE: Effect of artificial nuclei on the crystallization conditions and mechanical properties of crystalline polypropylene

SOURCE: Vysokomolekulyarnyye soyedineniya, v. 7, no. 12, 1965, 2108-2111

TOPIC TAGS: polypropylene, crystallization, polymer, solid mechanical property, nucleus

ABSTRACT: A study has been made of the effect of artificial crystallization nuclei on the morphological forms and mechanical properties of crystallizing polymers. Highly crystalline polypropylene specimens were used with or without 16% bismuth salicylate or titanium oxalate added as artificial crystallization nuclei. Morphology was studied with the MIN-8 polarizing microscope; the strength and deformability of the specimens were estimated with a pendulum type dynamometer. The specimens were prepared under different conditions (heating and cooling). The preparative conditions were shown to affect the diameter of the spherulite-type morphological forms produced; this diameter varied between 10 and 500  $\mu$  in individual experiments. Addition of artificial crystallization nuclei produced finer, more uniform morphological forms, accelerated crystallization, and improved the strength and deformability of specimens in a wide temperature range. Stretching of polypropylene specimens pre-

Card 1/2

UDC: 542.65+678.01:53+678.7

L 9492-66  
ACC NR: AP6001865

APPROVED FOR RELEASE: 08/25/2000  
Orig. art. has: 4 figures.

CIA-RDP86-00513R001651920007-0

SUB CODE: 20, 07/ SUBM DATE: 20Jan65/ ORIG REF: 005

Card 2/2

L 59593-65 EWT(1)/EWT(m)/EPF(c)/T/EEC(b)-2 Pc-4/Pr-4/Pi-4 IJP(c) GG/RM

ACCESSION NR: AP5017458

UR/0020/65/162/005/1092/1094

AUTHOR: Kargin, V. A. (Academician); Sogolova, T. I.; Kurbanova, I. I.

TITLE: The problem of artificial nucleation centers for crystallizable polymers

SOURCE: AN SSSR. Doklady, v. 162, no. 5, 1965, 1092-1094, and insert facing p. 1092

TOPIC TAGS: crystallization center, polypropylene, polyethylene, polyamide, crystalline polymer, polymer structure, heavy metal salt

ABSTRACT: The effect of artificial nucleation centers (heavy-metal salts of organic acids) on the macromolecular structure of crystalline polymers (polypropylene, polyethylene, polyamide) was investigated. The size of macromolecular spheroidal aggregates was found to decrease substantially upon introduction of bismuth salicylate, titanium oxalate, or lead acetate into polypropylene and polyamide. A similar effect was observed in low- and high-density polyethylene upon introduction of copper naphthionate, titanium oxalate, bismuth salicylate, cobalt naphthionate, lead palmitate, lead acetate, lead benzoate, and zinc acetate. The introduction of these nucleation centers causes an increase in the strength and

Card 1/2

L 59593-65

ACCESSION NR: AP5017458

deformability of polyethylene and polypropylene. It is concluded that by introducing heavy-metal salts of organic acids, one can control the macromolecular structure, strength, and deformability of crystalline polymers. Orig. art. has: 4 figures.

ASSOCIATION: Fiziko-khimicheskiy institut im. I. Ya. Karpova (Physicochemical Institute)

SUBMITTED: 11Jan65

ENCL: 00

SUB CODE: MT

NO REF SOV: 007

OTHER: 001

Card

AR  
2/2

L 00932-66 EWT(1)/EWT(m)/EPF(c)/ENP(j)/T/EEC(b)-2 IJP(c) GG/RM

ACCESSION NR: AP5021287

UR/0020/65/163/005/1194/1197

AUTHOR: Kargin, V. A. (Academician); Sogolova, T. I.; Rapoport, N. Ya.

TITLE: The mechanism of action of nuclei in crystallizing polymers

SOURCE: AN SSSR. Doklady, v. 163, no. 5, 1965, 1194-1197, and insert facing p. 1153.

TOPIC TAGS: organic crystal, crystal lattice structure, crystalline polymer, catalyzed crystallization, polystyrene, supercooling seed crystal, critical crystal size, induced crystallization, supercooled polymer

ABSTRACT: It was previously shown that the introduction of high-melting substances can initiate crystallization of polymers. The purpose of this work was to determine whether any solid particle, regardless of its chemical nature, can be introduced into a polymer and serve as a crystallization nucleus. Isotactic polystyrene was used as the polymer. Metal oxides and various high-melting organic compounds were introduced as seed crystals (2% by weight). It was found that the chemical nature of the seed crystals has a significant influence on their effectiveness as crystallization initiators. Hydrophilic inorganic crystals (quartz, oxides of zinc, aluminum, vanadium, and titanium) do not initiate crystallization of polystyrene, but do so effectively in the case of hydrophilic polymers, such as polycaprolactam. Organ-

Card 1/3

L 00932-66

ACCESSION NR: AP5021287

ic crystals (indigo, alizarine, and 1,5-dinitroanthraquinone) initiate crystallization of isotactic polystyrene, apparently because of the better ability of polystyrene to wet their surfaces. Similarly, hydrophilic cotton fibers do not initiate crystallization of polystyrene, but become effective crystallization initiators after hydrophobization with zinc stearate. It was also found that the crystal lattice parameters of the seed crystal need not correspond to those of the crystallizing polymer. Thus the "seed crystals" are apparently not true crystallization initiators, but rather structure-forming centers which promote arrangement of polymer chains at the crystal surface into configurations favorable to incipient crystallization. This is further supported by data on the correlation of crystal-size limits and temperature. Apparently, no upper crystal-size limit exists. The lower crystal-size limits change symbatically with temperature. The results obtained suggest two effective ways of utilizing the above crystallization initiators: 1) to lower the crystallization temperature for a given melt temperature, and 2) to lower the temperature of the molten polymer for a given crystallization temperature. Orig. art. has: 1 table. [VS]

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physicochemical Institute)

Card 2/3

L 00932-66

ACCESSION NR: AP5021287

SUBMITTED: 02Mar65

ENCL: 00

SUB CODE: 00, ss

NO REF SOV: 003

OTHER: 003

ATD PRESS: 4077

Card 3/3

DP



L 17714-66 EWP(j)/ENT(m)/T RM  
ACG NR: AP6003405 (A)

SOURCE CODE: UR/0190/66/008/001/0008/0010

AUTHORS: Paleyev, O. A.; Sheverdina, N. I.; Sogolova, T. I.; Paleyeva, I. Ye.;  
Kargin, V. A.; Kocheshkov, K. A.

ORG: Physico-Chemical Institute im. I. Ya. Karpov (Fiziko-khimicheskiy institut)

TITLE: Application of  $(n-C_3H_7)_2Cd$ ,  $n-C_3H_7CdCl$  and  $n-C_3H_7CdI$  in polymerization of ethylene 1,44.55

SOURCE: Vysokomolekulyarnyye soyedineniya, v. 8, no. 1, 1966, 8-10

TOPIC TAGS: polyethylene plastic, organocadmium compound, polymerization catalyst

ABSTRACT: In this work,  $(n-C_3H_7)_2Cd$  (I),  $n-C_3H_7CdCl$  (II), and  $n-C_3H_7CdI$  (III) in mixtures with  $TiCl_4$  were investigated as polymerization catalysts for propylene, substituting for the generally used organic aluminum compounds. This is an expansion of the earlier published study by the authors on organic cadmium compounds as components of mixed polymerization catalysts (Vysokomolek. soyed., 5, 846, 1963). II and III are white solids insoluble in n-hexane (solvent used in this polymerization), have poorly developed surface structure and, therefore, are

Card 1/2

UDC: 66.095.26+678.742

L 17714-66

ACC NR: AP6003405

inefficient as catalysts. I is readily soluble in organic solvents and was found to be a very effective catalyst at very low concentrations (1 g mole per 11 kg of polyethylene). The product prepared with I (softening point 137--139C) has high tensile strength (4400--4500 kg/cm<sup>2</sup>), and may serve in the preparation of strong oriented films and fibers. Orig. art. has: 1 table.

SUB CODE: 07/ SUBM DATE: 28Jan65/ ORIG REF: 004/ OTH REF: 001

Card 2/2

nst

L 22869-66	EWI(m)/EWP(j)/T/ETC(m)-6	WW/DJ/RM
ACC NR: AP6012709	SOURCE CODE: UR/0190/66/008/004/0645/0649	
AUTHOR: Kargin, V. A.; Sogolova, T. I.; Rubshteyn, V. M.		
ORG: Physicochemical Institute im L. Ya. Karpov (Fiziko-khimicheskiy institut)		
TITLE: Effect of artificial seeds on the impact toughness and wear resistance of crystallizing polymers		
SOURCE: Vysokomolekulyarnyye soyedineniya, v. 8, no. 4, 1966, 645-649		
TOPIC TAGS: crystallizing polymer, impact toughness, wear resistance, artificial seeding, morphological form		
ABSTRACT: Artificial seeding is an effective method for controlling the morphology of crystallizing polymers and improving their mechanical properties. This paper describes the results of a study of the effect of artificial seeding on the impact toughness and wear resistance of such polymers. The tests were conducted with a pendulum-hammer and a Grasselli-type machine, respectively, which were developed by the authors for testing small-size polymer specimens in a wide temperature range. The apparatuses and procedures are described in the source. The experiments were conducted with polypropylene (PP), polyamide 548 and isotactic polystyrene seeded with organic salts such as bismuth salicylate (0.5%), titanium oxalate (0.5%), or lead acetate (1%), or with indigo (2%). Study of cross sections of the original and seeded polymers showed that seeding decreased spherulite size (e.g., from 100 to 10-12 μ		
Card 1/2	UDC: 678.01:53	

L22869-66

ACC NR: AP6012709



Fig. 1. Abrasion resistance of original polypropylene (1), and of polypropylene seeded with bismuth salicylate (2) or titanium oxalate (3)

in the case of PP, and resulted in uniform morphology. Seeding was shown to improve the impact toughness (e.g., from 6 to 40 kg·cm/cm<sup>2</sup> at 10C in the case of PP) and the wear resistance of the polymers. Abrasion tests were conducted with the use of a metal grate (S. B. Ratner's method), and abrasion was estimated from weight loss data. The results of abrasion tests of PP are given (see Fig. 1). Orig. art. has: 5 figures [B0]

SUB CODE: 11/ SUBM DATE: 15Apr65/ ORIG REF: 008/ ATD PRESS: 4234

Card 2/2

L 37085-66 EWP(j)/EWT(m)/T IJP(c) RM

SOURCE CODE: UR/0190/66/008/005/0949/0951

ACC NR: AP6015059

AUTHORS: Koretskaya, T. A.; Sogolova, T. I.; Kargin, V. A.

ORG: Physico-Chemical Institute im. L. Ya. Karpov (Fiziko-khimicheskiy institut)

TITLE: Electronmicroscopic investigation of the crystallization of polymers in the presence of artificial crystallizing agents

SOURCE: Vysokomolekulyarnyye soyedineniya, v. 8, no. 5, 1966, 949-951

TOPIC TAGS: polypropylene plastic, polyethylene plastic, electron microscopy, crystallization/ JEM-5Y electron microscope

ABSTRACT: The effect of high melting, low molecular weight additives (e.g., bismuth salicylate-I, titanium oxalate, copper naphthionate-II, zirconium oxalate-III, silica gel, etc) upon crystallization of polypropylene and high and low density polyethylene was investigated by means of electronmicroscopy. The study was performed using electron microscope JEM-5Y. The samples of crystallizing agents were introduced as suspensions into the solutions or melts of the polymers. Independently of their chemical structure, the artificial nuclei result in orientation of the polymer at the polymer-nucleus interphase and are effective when the supramolecular spherulitic and dendritic structures are formed. The structures formed in the presence of nuclei are similar in their morphology to those formed in the absence of the artificial nuclei.

UDC: 678.01:53

Card 1/2

L 37085-56

ACC NR: AP6015059

Particles of the order of  $0.03\text{--}0.04\ \mu$  act as artificial nuclei in experiments with polypropylene and III. I and II were found to be of little effect when high density polyethylene crystallizes as monocrystals, but are quite effective when the crystallization results in spherulitic formation. Orig. art. has: 4 figures.

SUB CODE: 07/

SUBM DATE: 29May65/

ORIG REF: 007

*ns*  
Card 2/2

L 35832-66 EMP(j)/EMT(m)/T IJP(c) RM

ACC NR: AP6015730

SOURCE CODE: UR/0032/66/032/005/0609/0611

AUTHOR: Rubshteyn, V. M.; Belynskiy, V. A.; Sogolova, T. I.; Kargin, V. A.

ORG: Scientific Research Physico-Chemical Institute im. L. Ya. Karpov (Nauchno-issledovatel'skiy fiziko-khimicheskiy institut) 45

TITLE: Instruments for testing small amounts of polymer materials 44

SOURCE: Zavodskaya laboratoriya, v. 32, no. 5, 1966, 609-611 B

TOPIC TAGS: polymer structure, polymer chemistry, physical chemistry instrument, thermoplastic material, tensile strength, elongation, film processing  
ABSTRACT: The article describes three newly developed instruments which are recommended for use in laboratories involved in the study of the properties and the structure of polymers over a wide temperature interval. The first is a dynamometer of the pendulum type (illustrated in the article) designed for determination of the tensile strength and the elongation limits of polymer materials over a wide temperature interval and at different rates of elongation. The initial size of the samples used is: length 10-20 mm, width 1-5 mm, thickness 0.05-0.5 mm; the volume of the minimum amount of material is 0.5 mm<sup>3</sup>, and the maximum is 50 mm<sup>3</sup>. The article gives detailed specifications of the instrument. The second development is an instrument for the elongation of wide films.

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With this instrument, tests can be made of the deformation of polymer material at temperatures from 20 to 250°C in an argon atmosphere. The third and final development described is a laboratory extruder designed to produce fibers from small quantities of thermoplastic materials. The article gives detailed dimensions and specifications. Orig. art. has: 3 figures.

SUB CODE: 11/ SUBM DATE: none

Card 2/2

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TITLE: Controlling the mechanical properties of polymers by modifying their morphological forms [Paper presented at the First Conference on Polymer Mechanics held in Riga in November 1965]

SOURCE: Mekhanika polimerov, no. 5, 1966, 643-650

TOPIC TAGS: polymer structure, polymer physical property, polypropylene plastic, polyethylene plastic

**ABSTRACT:**

Recent developments in the control of polymer morphology involving the addition of artificial nucleus-forming agents (NFA's) -- finely-divided particles of substances inert to the polymers -- have been highlighted in a Soviet paper.

The most effective NFA's proved to be certain salts such as bismuth salicylate, titanium oxalate, lead benzoate, lead acetate, lead phosphate, copper naphthionate, zinc acetate, and cadmium benzoate. Addition of small amounts (0.2—0.5%) of these NFA's to polymers makes it possible to control morphology and to improve mechanical properties without affecting the color of the polymers; this is in contrast to dyes used in the past for this purpose.

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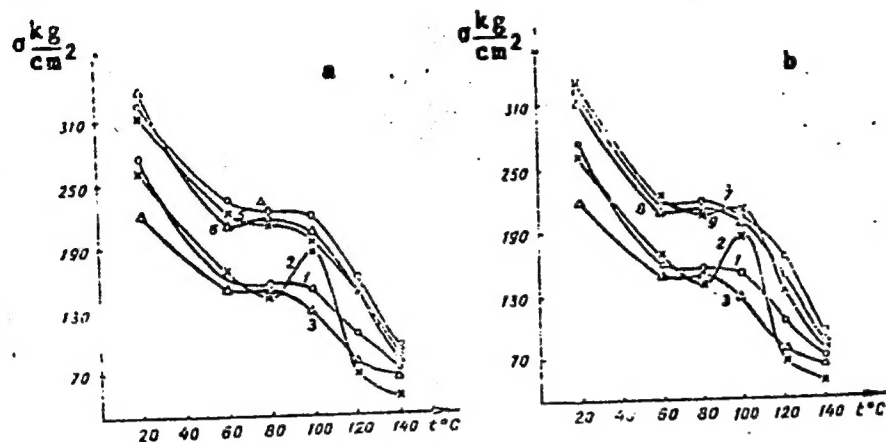


Fig. 1. Effect of widely different preparation conditions on the temperature dependence of [tensile] strength for polypropylene: initial polypropylene (curves 1,2,3); polypropylene containing titanium oxalate (curves 4,5,6) or bismuth salicylate (curves 7,8,9)

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The presence of NFA's (salts) in polymers considerably decreases the effect of crystallization conditions on morphology, increases the mechanical strength of samples prepared under different crystallization conditions in a wide range of temperatures, and improves the stability of the polymers to thermal effects during preparation. (See Fig. 1.)

Mechanical property measurements showed, e.g., that the addition of NFA considerably improves the wear resistance and impact strength, and lowers the brittle point of polypropylene. The addition of 0.2% of certain NFA's improves the [tensile] strength of polypropylene and low-density polyethylene by 200—250%.

NFA's slow down the necking of polypropylene films (80 to 100  $\mu$  thick) on stretching. The addition of 0.5% bismuth salicylate to polypropylene increases the induction period of the necking of films subjected to a constant stress of 310 kg/cm<sup>2</sup> from 80 sec for the initial polymer to 8000 sec for polypropylene which contains added NFA.

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Experiments conducted with slowly crystallizing isotactic polystyrene showed that solid, finely divided NFA particles do not accelerate the linear growth rate of spherulites. Instead, NFA particles decrease the size and increase the number per unit volume of spherulites by increasing the number of crystallization nuclei. The solid NFA particles are often located in the center of morphological forms, but do not actually represent crystallization nuclei.

The nucleus-forming effect of the added NFA particles does not require that the types and parameters of the crystalline lattices of the particle and polymer be the same; glassy particles, liquid drops, or gas bubbles also produce a nucleus-forming effect.

The mechanism of nucleus formation was studied by varying the heating temperature of polymer melts and the crystallization temperature. Experiments conducted with an isotactic polystyrene, whose intrinsic crystallization nuclei had been eliminated by heat treatment and to which large crystals of indigo or other substances had been added, showed 1) that the presence of foreign particles initiates the formation of intrinsic nuclei in the polymer, and 2) that the effectiveness of the particles depends on temperature.

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The results of the research confirmed that the addition to polymers of finely divided NFA particles accelerates crystallization, decreases the size of and makes it possible to control the morphological forms of the polymers, and improves the heat resistance and mechanical properties of the polymeric materials.

The use of NFA is recommended for the preparation of bulky articles because NFA accelerates crystallization; it is also recommended for use in structures or products subject to thermal shock. The new method for controlling the morphology (and hence the properties) of polymers is expected to promote wider use of polymers as construction materials.

This research was carried out at the Physicochemical Scientific Research Institute im. L. Ya. Karpov. The author of the article is a close associate of Academician V. A. Kargin, a leading Soviet scientist whose chief area of interest is the relationship between the morphological forms and the mechanical properties of polymers. [FSB: v. 3, no. 2]

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